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# Gender Differences in Smoking Behavior and Dependence Motives Among Daily and Nondaily Smokers

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## Abstract

**Introduction:** While the overall prevalence of smoking has declined, nondaily smoking is on the rise. Among daily smokers (DS) men tend to smoke more cigarettes per day and have higher dependence. Unfortunately little is known about gender differences in nondaily smokers (NDS).

**Methods:** This secondary-data analysis utilized data from a cross-sectional online survey. Participants reported on smoking behavior (eg, cigarettes per day, history of quit attempts) and nicotine dependence motives as assessed by the Brief Wisconsin Inventory of Dependence Motives via the primary and secondary subscales (ie, core features of tobacco dependence such as craving and accessory motives such as weight control, respectively).

**Results:** Participants were 1175 DS (60% women) and 1201 NDS (56% women). Two interactions between group and gender were noted suggesting that the NDS had greater gender differences in past quit attempts ($P < .01$) and reported change in smoking behavior over the past year ($P < .01$). Further, among the NDS group, men scored significantly higher than women on both the primary and secondary dependence motives subscales ($3.6 \pm 0.1$ vs. $2.9 \pm 0.1$, $P < .0001$; $3.8 \pm 0.1$ vs. $3.3 \pm 0.1$, $P < .0001$; respectively). There were no significant differences in dependence motives in the DS group ($P > .05$).

**Conclusions:** Gender differences in smoking behavior and dependence motives varied between NDS and DS. Specifically, gender differences in smoking behavior and smoking dependence motives may be larger among NDS compared to DS. Additional research is needed to explore how these relationships may relate to smoking cessation in NDS.

## Introduction

Among daily smokers (DS), women smoke fewer cigarettes per day (CPD) and have lower nicotine dependence.[1,2] The lower consumption may be related to gender differences in motivations for smoking. Specifically, women who smoke daily tend to do so in response to non-nicotine stimuli (such as cue exposure, stress reduction, or weight control) whereas men are more likely to smoke to maintain nicotine levels.[1–3] Though the literature is mixed, there also appears to be gender differences in cessation outcomes. Overall, women may have poorer cessation rates than men.[4] Women tend to have

improved smoking cessation rates when treated with non-nicotine interventions (eg, counseling, very low nicotine content cigarettes) whereas men do better with nicotine interventions (eg, nicotine replacement products).[5,6] Overall, the data indicates that there are gender differences in smoking behavior and motives for smoking among DS, and that these differences may contribute to differences in smoking cessation outcomes. However, these observations have been limited to DS; very little is known about gender differences among nondaily smokers (NDS).

Examining smoking behavior in NDS has become increasingly important as the prevalence of this segment of the smoking population continues to rise.[7,8] Current estimates indicate that approximately one out of four smokers report nondaily smoking, with no differences in nondaily smoking prevalence by gender.[7,9] Traditionally, smoking frequency (eg, CPD) has been thought to be tied to the need to maintain relatively stable nicotine levels.[10] However, this is likely not true for NDS who abstain from smoking for days at a time while experiencing significantly less withdrawal or craving compared to DS.[11] While a high proportion (68%) of NDS report wanting to quit smoking,[12] only one known treatment study has been conducted among adult NDS,[13] and knowledge to create smoking cessation interventions designed to meet the needs of NDS is lacking. Understanding why NDS continue to smoke despite the desire to quit, as well as gender-related differences in smoking behaviors and dependence motives, is critical for the development of gender-specific smoking cessation interventions for this growing population.

This article aims to examine gender differences in smoking behavior and dependence motives among NDS as compared to DS. Overall, we expected gender differences in NDS to be similar to those observed in DS.[1–3] That is, we hypothesized the following would be observed within the NDS group: (1) as compared to men, women would report smoking less (eg, fewer CPD) and have a more substantial quit history (eg, greater number of quit attempts and longer quit attempts, as well as be more likely to be a former DS), and (2) women would score higher on the non-nicotine related subscales (eg, weight control, social/environmental goads) of the Brief Wisconsin Inventory of Smoking Dependence Measures[14] whereas men would score higher on the nicotine related subscales (eg, craving, tolerance). We expected to observe the same gender differences in the DS group as well.

## Methods

### Study Sample

This project is a secondary data analysis of a larger project that was designed to explore the racial and ethnic differences in DS and NDS.[15] Participants were recruited via Survey Sampling International in July–August, 2012. To be eligible participants had to report smoking at least 100 cigarettes in their lifetime and at least one cigarette/d smoked on at least four of the last 30 days. Additional eligibility criteria included at least 25 years of age, English fluency, self-reported race/ethnicity as African American, white or Latino (of any race), no current pregnancy or breastfeeding, and no recent (<30 days) smoking cessation treatment. Participants were recruited such that equal numbers of participants by race/ethnicity were in the daily and nondaily smoking groups.

Study participants were stratified into one of two smoking groups. The DS group was defined as reporting smoking at least one cigarette per day on at least 25 out of the last 30 days. The NDS group was defined as reporting smoking at least one cigarette per day on four to 24 out of the last 30 days. Quota sampling was used to ensure equal race (African American, white, Latino) and smoking status (NDS, DS) group sizes were obtained.

### Procedures

All data collection occurred via an online survey. Potentially eligible participants were directed to an informed consent webpage. Upon providing informed consent, participants were screened for eligibility. Those who were eligible were then provided with the full survey. Those who completed the survey were enrolled into a Survey Sampling International quarterly lottery for a chance to win $12 500. Further, Survey Sampling International participants can earn points, which are redeemable for cash, for completing surveys. All procedures were approved by the University of Minnesota's Institutional Review Board. Additional information on the recruitment and procedures can be found elsewhere.[15]

### Measures

Smoking behavior assessments included current use, quit efforts, quit intentions and recent changes in behavior. First, in terms of current use, participants reported current average CPD and number of days smoked out of the past 30 days. Second, regarding quit efforts, participants self-reported the number of quit attempts and the longest quit attempt in the past 12 months. Participants subjectively indicated their change in smoking rate compared to a year ago (smoking the same, more, or less than 1 year ago). Next, participants reported their quit intentions by selecting from one of four options (never expect to quit, may quit in the future but not in the next 6 months, will quit in the next 6 months, will quit in the next 30 days). Finally, for the NDS group only, participants were classified as former DS if they reported ever smoking daily for at least 6 months.

Smoking dependence was evaluated using the Brief Wisconsin Inventory of Smoking Dependence Motives.[14] The Brief Wisconsin Inventory of Smoking Dependence Motives is a 37-item scale that uses a seven-point Likert-type scale. This measure produces 11 subscales that encompass both nicotine and non-nicotine related motives for smoking, including affiliative attachment, affective enhancement, automaticity, loss of control, cognitive enhancement, craving, cue exposure/associative processes, social/environmental goads, taste, tolerance, and weight control. It also includes two overall subscales: primary dependence motives (composed of automaticity, loss of control, craving, and tolerance) and secondary dependence motives (composed of all other subscales).

Finally, participants also completed several items to assess demographic variables. These items included gender, age, race/ethnicity, education level, employment status, and monthly household income.

### Statistical Analysis

Descriptive statistics (including means and standard deviations for continuous variables, and frequencies for categorical variables) were calculated to describe the study sample. Differences between smoking groups (NDS vs. DS) and genders (men vs. women) were assessed using *t* tests and chi-square tests. To address the study aims, logistic regression (for categorical outcomes) and linear regression (for continuous outcomes) models were used. Separate models were run to examine gender differences within each smoking group (NDS vs. DS) and the interaction between smoking group (NDS vs. DS) and gender (men vs. women). Potential confounders were assessed hierarchically within each model and controlled for when

necessary. Potential confounders, listed in order, were age, race (African American, Latino, white), education (five ordinal categories), employment (nine nominal categories), and monthly income (eight ordinal categories). Log transformation was used for variables with a non-normal distribution (CPD, number of quit attempts in the past 12 months). Statistical significance was set at 0.05. No adjustments were made for multiple comparisons. All analyses were done using SAS 9.2.

## Results

### Study Sample

A total of 2376 participants completed the survey with approximately half in the NDS group due to quota sampling (50.5%; $n$ = 1201). There were more women in the NDS group than the DS group ($P$ = .018). As described in Table 1, there were several statistically significant differences in demographic variables between the two smoking groups, as well as by gender within each smoking group. Consequently, the remaining analyses were adjusted for age, race, education, employment, and/or income.

### Gender Differences in Smoking Behavior

Among the NDS group, women reported making more quit attempts in the past year and were more likely to subjectively report a reduction in smoking compared to the previous year. They also were more likely to report that they intended to quit within the next 30 days (Table 2). Men reported a longer past quit attempt. No significant differences were observed in terms of cigarettes smoked per day, being former DS, or number of years as a NDS.

Among the DS group, compared to men, women smoked fewer CPD but smoked on more days per month. However, when the number of cigarettes smoked per day was averaged over the past 30 days there were no significant differences between genders. Women had significantly fewer quit attempts than men and were more likely to report an intention to quit within the next 3 months. No other significant gender differences in smoking behavior were noted in the DS group.

Two significant interactions were noted between smoking group and gender. The first interaction indicated that the gender difference in the number of past year quit attempts was significantly greater in the NDS group than the DS group. Similarly, there was a greater gender difference in the frequency of subjective report of reduced smoking as compared to the previous year in the NDS group than the DS group ($P$ < .01). No other significant interactions between smoking group and gender were identified.

### Gender Differences in Smoking Dependence

Among the NDS group, women scored significantly lower than men on all Wisconsin Inventory of Smoking Dependence Motives subscales (Table 3). This difference ranged from an 8% lower score for women on the social/environmental goads subscale up to a 26% lower score for women on the tolerance subscale.

Among the DS group, there were no significant gender differences on any of the smoking dependence subscales ($P$ > .05).

With the exception of the social/environmental goads subscale ($P$ = .610), the interaction between smoking group and gender was statistically significant for all subscales ($P$ < .05) indicating the gender differences were greater in the NDS group compared to the DS group.

## Discussion

The results of this study indicate that gender differences vary between DS and NDS. In fact, our data suggests that gender differences may be greater in NDS when compared to DS in terms of reported past quit attempts and recent changes in smoking behavior, as well as all smoking dependence motives investigated. This data, overall, suggest that observations made in DS should not be generalized to NDS. We also noted that among DS, women had a significantly fewer quit attempts in the past year, but no gender differences were observed in CPD over the past 30 days, longest quit attempt in past year, and subjective report in the change in smoking from last year. Conversely, among NDS, compared to their male counterparts, women reported a significantly greater number of past quit attempts, shorter longest quit attempt in the past year, and more women reported a decline in their smoking compared to last year. Overall, nearly 40% of NDS reported an intention to quit within 6 months suggesting that many NDS are motivated to quit smoking, which concurs with previous literature.[12] This may be especially true for women NDS as more women than men indicated an intention to quit within 30 days (12% vs. 8%). The data may also suggest that women who do not smoke daily may have a more difficult time achieving smoking cessation; however, additional research is needed to explore this idea. The pattern of differences in quit attempts and intentions is particularly interesting given that, contrary to our hypothesis, we did not observe any statistically significant gender differences in CPD or frequency of former daily smoking among the NDS. Thus, it is unlikely that the differences in quit intentions are being driven by a gender difference in a physical dependence to nicotine (eg, CPD) or a transition from daily to nondaily smoking.

We also observed divergent patterns of gender differences in measures of smoking dependence motives. Women scored lower than men on all of the smoking dependence motives (eg, Wisconsin Inventory of Smoking Dependence Motives subscales) in the NDS group whereas there were no significant gender differences in smoking dependence motives among the DS. Previous research has indicated that women tend to smoke more for non-nicotine related reasons such as weight control and cue exposure.[1,3] Thus, it is surprising that among the NDS group, women scored significantly lower on the secondary dependence motives subscale and that no gender difference was observed in the DS group. We did, however, note three trends in the DS group suggesting that women may experience greater dependence motives in the area of loss of control, craving and weight control. While these differences were not statistically significant, they were in line with the hypothesized direction suggested by previous research.[1] However, given the large sample size, a lack of statistical power to detect gender differences is likely not the explanation for the null findings in the DS group. Alternative explanations for the null findings may be related to the declining prevalence of DS (eg, more highly dependent smokers remain daily smokers regardless of gender). Further, given that previous research in DS has demonstrated that the subscales of "Automaticity" and "Tolerance" are predictive of smoking cessation outcomes,[16] our observations would suggest that nondaily smoking men would have poorer cessation outcomes than nondaily smoking women, yet nondaily smoking women in our sample reported less success in previous quit attempts (ie, more attempts for shorter duration). It is important to note, however, that the predictive validity of the dependence motives subscales on cessation outcomes has yet to be evaluated among NDS. Future research in this area is warranted.

**Table 1.** Demographic Characteristics by Smoking Group and Gender ($n = 2376$)

| | Nondaily smokers ($n = 1201$) | | | | Daily smokers ($n = 1175$) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | All | Men ($n = 531$) | Women ($n = 670$) | Gender difference[a] | All | Men ($n = 463$) | Women ($n = 712$) | Gender difference[a] | Smoking group difference[a] |
| Age (mean ± standard error) | 41.38 ± 0.36 | 40.64 ± 0.54 | 41.97 ± 0.48 | 1.87 (0.06) | 44.59 ± 0.36 | 44.39 ± 0.57 | 44.73 ± 0.46 | 0.46 (0.64) | 6.34 (<0.01) |
| Race[b] | AA: 33.4%; L: 33.3%; W: 33.3% | AA: 29.9%; L: 40.7%; W: 29.4% | AA: 36.1%; L: 27.5%; W: 36.4% | 23.32 (<0.01) | AA: 33.5%; L: 32.9%; W: 33.7% | AA: 35.4%; L: 32.0%; W: 32.6% | AA: 32.2%; L 33.4%; W: 34.4% | 1.34 (0.51) | 10.40 (0.01) |
| Education (% >high school or equivalent) | 75.9% | 80.6% | 72.1% | 11.72 (<0.01) | 71.0% | 72.8% | 69.8% | 1.21 (0.27) | 10.85 (<0.01) |
| Employment (%full-time) | 44.6% | 56.2% | 43.8% | 56.00 (<0.01) | 42.0% | 54.0% | 34.1% | 45.47 (<0.01) | 102.32 (<0.01) |
| Household income (% ≥$3000/mo) | 68.1% | 77.6% | 59.0% | 27.10 (<0.01) | 74.6% | 81.3% | 69.7% | 10.72 (<0.01) | 34.50 (<0.01) |

[a]*T*-value or $\chi^2$ (*P* value).

[b]AA: African American, L: Latino (of any race), W: white.

Overall these data suggest that there are gender differences among NDS and that these difference do not necessarily follow the same pattern observed in DS. The implications of the observed gender differences in the nondaily smoking group may be applied to smoking cessation interventions. For instance, the greatest observed gender difference was on the tolerance subscale in which female NDS scored 26% lower than men. These data suggest that, like male DS, male NDS may receive significant benefit from pharmacotherapy smoking cessation interventions that directly address the physical addiction to nicotine such as the nicotine patch.[1,2] Interestingly, within NDS and DS of both genders, the highest scoring subscale was the taste subscale. This observation suggests that products like the low nicotine content cigarette may prove successful as smoking cessation aids as they provide similar taste and sensory sensations. While the low nicotine content cigarette has recently been shown to be especially effective in women DS,[5] it has yet to be evaluated as a cessation aid in NDS.

While this project was strengthened by its diverse study sample, it does contain some limitations. First, participants were limited to those registered with Survey Sampling International. It is unknown how representative this group is of the general population. Therefore, selection bias is likely and generalizability is unknown. Second, all data reported was based on self-report, which may limit the quality of the data collected. Finally, it is limited to exploring gender differences in the traditional male and female categories, and not in transgendered individuals. Despite these limitations, this article is the first to examine gender differences in smoking behavior and in dependence among both NDS and DS and, therefore, advances the field.

In conclusion, among NDS, women reported lower smoking dependence motives than men. The gender differences in smoking dependence were not observed in DS, indicating that gender differences observed in DS should not be generalized to NDS. Additional research is needed to confirm these observations and explore how they may be utilized to create more effective gender-specific smoking cessation interventions for NDS.

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## Declaration of Interests

*None declared.*

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**Table 2.** Smoking Behavior by Smoking Group and Gender ($n$ = 2376)

| | Nondaily smokers ($n$ = 1201) | | | | Daily smokers ($n$ = 1175) | | | | Gender × smoking group interaction[a] |
|---|---|---|---|---|---|---|---|---|---|
| | All | Men ($n$ = 531) | Women ($n$ = 670) | Gender difference[a] | All | Men ($n$ = 463) | Women ($n$ = 712) | Gender difference[a] | |
| CPD, on days smoked[b] | 5.50 ± 0.22 | 5.43 ± 0.23 | 5.37 ± 0.20 | 0.04 (0.85) | 14.13 ± 0.22 | 14.80 ± 0.42 | 13.66 ± 0.34 | 4.35 (0.04) | 3.10 (0.08) |
| Number of days smoked in past 30 days[b] | 14.56 ± 0.13 | 14.78 ± 0.26 | 14.33 ± 0.23 | 1.65 (0.20) | 29.58 ± 0.13 | 29.44 ± 0.06 | 29.73 ± 0.05 | 16.62 (<0.01) | 0.31 (0.58) |
| CPD, over past 30 days[b,c] | 2.80 ± 0.20 | 2.72 ± 0.14 | 2.74 ± 0.12 | 0.04 (0.84) | 14.02 ± 0.20 | 14.60 ± 0.42 | 13.60 ± 0.34 | 0.93 (0.32) | 0.35 (0.55) |
| Years smoking daily | — | — | — | — | 21.12 ± 0.26 | 21.29 ± 0.41 | 21.01 ± 0.32 | 0.29 (0.59) | — |
| Years smoking some days | 11.45 ± 0.29 | 11.26 ± 0.43 | 11.60 ± 0.39 | 0.34 (0.56) | — | — | — | — | — |
| Number of quit attempts in past 12 months[b] | 7.17 ± 0.38 | 6.22 ± 0.69 | 8.13 ± 0.64 | 7.61 (<0.01) | 3.69 ± 0.46 | 4.03 ± 0.49 | 3.41 ± 0.36 | 5.42 (0.02) | 10.85 (<0.01) |
| Longest quit attempt in past 12 months (d)[b] | 75.34 ± 2.88 | 83.10 ± 4.27 | 67.93 ± 4.16 | 6.19 (0.01) | 80.14 ± 3.67 | 79.53 ± 5.93 | 80.46 ± 4.35 | 0.02 (0.90) | 3.68 (0.06) |
| Change from last year (%) | Same: 32%; more: 12%; less: 56% | Same: 42%; more: 11%; less: 47% | Same: 24%; more: 14%; less: 62% | 20.44 (<0.01) | Same: 48%; more: 18% less: 34% | Same: 53%; more: 15%; less: 32% | Same: 45%; more: 20%; less: 34% | 2.54 (0.11) | 9.71 (<0.01) |
| Quit intentions (%) | Never: 10%; >6 months: 50%; <6 months: 29%; < 30 days: 10% | Never: 13%; >6 months: 53%; <6 months: 26%; <30 days: 8% | Never: 8%; >6 months: 48%; <6 months: 32%; <30 days: 12% | 16.03 (<0.01) | Never: 12%; >6 months: 59%; <6 months: 24%; <30 days: 5% | Never: 16%; >6 months: 59%; <6 months: 22%; <30 days: 4% | Never: 9%; >6 months: 59%; <6 months: 25%; <30 days: 6% | 10.76 (<0.01) | 0.23 (0.63) |
| Former daily smoker (%) | 75.30% | 74.60% | 75.80% | 0.19 (0.66) | — | — | — | — | — |

CPD = cigarettes per day.

[a]$F$-value or Wald $\chi^2$ ($P$ value) adjusted for age, race, education, employment, and/or income.

[b]Adjusted mean ± standard error.

[c]Calculated as ([CPD] × [days reported smoking in past month])/30.

**Table 3.** Wisconsin Inventory of Smoking Dependence Motives Subscale Scores (Adjusted[a] Mean ± *SE*) by Smoking Status and Gender (*n* = 2376)

| | Nondaily smokers (*n* = 1201) | | | Daily smokers (*n* = 1175) | | | Gender × smoking group interaction |
|---|---|---|---|---|---|---|---|
| | Men (*n* = 531) | Women (*n* = 670) | β, *P* | Men (*n* = 463) | Women (*n* = 712) | β, *P* | *F*-value, *P* |
| Affiliative attachment | 3.3 ± 0.1 | 2.7 ± 0.1 | 0.70, <.0001 | 3.9 ± 0.1 | 3.9 ± 0.1 | 0.01, .9459 | 23.22, <.0001 |
| Affective enhancement | 3.9 ± 0.1 | 3.3 ± 0.1 | 0.52, <.0001 | 4.6 ± 0.1 | 4.7 ± 0.1 | −0.07, .4683 | 10.34, .0013 |
| Automaticity | 3.9 ± 0.1 | 3.1 ± 0.1 | 0.75, <.0001 | 4.7 ± 0.1 | 4.9 ± 0.1 | −0.14, .1945 | 42.40, <.0001 |
| Loss of control | 3.4 ± 0.1 | 2.7 ± 0.1 | 0.64, <.0001 | 4.4 ± 0.1 | 4.6 ± 0.1 | −0.16, .0992 | 19.07, <.0001 |
| Cognitive enhancement | 3.8 ± 0.1 | 3.1 ± 0.1 | 0.66, <.0001 | 4.4 ± 0.1 | 4.4 ± 0.1 | 0.00, .9977 | 20.57, <.0001 |
| Craving | 3.7 ± 0.1 | 3.2 ± 0.1 | 0.58, <.0001 | 4.8 ± 0.1 | 5.0 ± 0.1 | −0.16, .0931 | 36.43, <.0001 |
| Cue exposure/associative processes | 3.9 ± 0.1 | 3.5 ± 0.1 | 0.43, <.0001 | 4.5 ± 0.1 | 4.5 ± 0.1 | −0.05, .5937 | 14.02, .0002 |
| Social/environmental goads | 3.9 ± 0.1 | 3.6 ± 0.1 | 0.32, .0041 | 4.3 ± 0.1 | 4.3 ± 0.7 | 0.03, .7632 | 3.15, .0610 |
| Taste | 4.4 ± 0.1 | 3.8 ± 0.1 | 0.66, <.0001 | 5.1 ± 0.1 | 5.0 ± 0.1 | 0.08, .4087 | 31.15, <.0001 |
| Tolerance | 3.4 ± 0.1 | 2.5 ± 0.1 | 0.83, <.0001 | 4.5 ± 0.1 | 4.5 ± 0.1 | −0.02, .7934 | 38.18, <.0001 |
| Weight control | 3.2 ± 0.1 | 2.9 ± 0.1 | 0.28, .0124 | 3.4 ± 0.1 | 3.6 ± 0.1 | −0.20, .0759 | 44.95, .0004 |
| Primary dependence motives[b] | 3.6 ± 0.1 | 2.9 ± 0.1 | 0.74, <.0001 | 4.6 ± 0.1 | 4.7 ± 0.1 | −0.14, .0863 | 49.13, <.0001 |
| Secondary dependence motives[c] | 3.8 ± 0.1 | 3.3 ± 0.1 | 0.52, <.0001 | 4.3 ± 0.1 | 4.4 ± 0.0 | −0.03, .6864 | 26.03, <.0001 |

*SE* = standard error.

[a]Stepwise adjustments were made hierarchically (age, race, education, employment, income, and cigarettes/d).

[b]Comprised of the following subscales: automaticity, loss of control, craving, and tolerance.

[c]Comprised of the following subscales: affiliative attachment, affective enhancement, cognitive enhancement, cue exposure/associative processes, social/environmental goads, taste, and weight control.

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